

High Apical Corneal Astigmatism Masked with Rigid Corneal Gas Permeable Contact Lens

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Background

A 24-year old male baseball player (RM) presented to clinic with complaints of blurry vision. Patient arrives to clinic uncorrected, but reports sporadic use of spherical soft contact lenses in the past with no history of spectacle correction. Patient reports "perfect vision" until age 17 when he began to experience declining visual quality. RM reports OS blunt force ocular trauma and periorbital hematoma at ages 6, 7, and 14, but vision was reported to be unaffected after each of these incidents.

Entering acuities were unaided

Distance: OD 20/40- (PH 20/25)

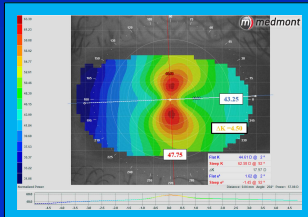
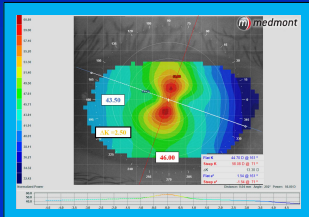
OS: 20/60- (PH 20/40)

The anterior and posterior segment exam was unremarkable. A macular OCT was performed which was unremarkable.

Corneal topography was taken and revealed bilateral, high, apical, symmetric with-the-rule astigmatism with K's of:

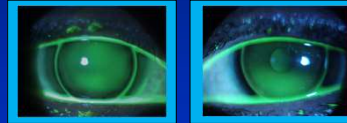
OD: 44.50x161/58.25x071 (AK=13.75D), ecc. 1.54x161/-1.53x080

OS: 44.50x006/62.50x092 (AK=18.00D), ecc. 1.62x002/-1.45x092



Case Description

Physiological narrow palpebral fissure coupled with habitual squinting were noted while acuities were taken. Although the patient's acuities were functional with activities of daily living, based on the RM's aspirations, we hoped to improve his vision. The best way to mask the RM's significant corneal astigmatism and thus to improve the RM's vision is to fit a non-flexing GP. Though the patient had a significant amount of central corneal astigmatism after analyzing the corneal topography on axial display it was noted the midperipheral cornea was near rotationally symmetric at a cord of 6.0 mm. With this information we trialed lenses from the available diagnostic bitoric GP fitting set equivalent to the flat meridian that most closely matched that of RM.



The right eye was fit with 44.00/47.50 and yielded surprisingly acceptable fit with good centration, appropriate edge lift, apical clearance and unrestricted vertical movement. The same lens (44.00/47.50) was fit on the left eye and was too steep with a large area of peripheral bearing 360. This can be explained by the topography; the left eye had a greater difference in curvature at a 6.0mm chord as well as higher overall apical K values. A second GP trial lens that was 0.50 flatter (43.50/47.00) in both meridians fit on the left eye with great fit and minimal edge lift. This OD lens was ordered with peripheral curve 1 step flat in an effort to allow for optimal movement and provide adequate tear exchange. A spherical over-refraction was performed, and RM was able to achieve 20/20 vision in both eyes for the first time in years!

Conclusion

By topographical axial display as well as central K values, there appears to be significant corneal astigmatism (OD $\Delta K=17.25D$ and OS $\Delta K=14.25D$). However, good fit was achieved with rigid lens toricity of only 3.50D OU. This subjective lens fit evaluation is validated from topography data which shows peripheral K values within normal range and a ΔK of just 2.50D and 4.50D in the right and left eyes, respectively, at 6mm from center to the temporal and inferior cornea. These normal base curve values are what indicated the choice of a rigid corneal lens could be successful. If we were to design the toricity of a corneal GP based only on the central Ks, a much more toric lens would have been suggested. This extra lens toricity is unneeded in this case. Because the rigid lens masks the RM's apical astigmatism, the patient was able to achieve great vision that would not be obtainable through spectacle lenses or a soft CL modality.

Eye	Apical power	ΔK central	ΔK at 3.0mm	Final Contact Lens Dispensed
OD	56.00	44.50/57.25 (AK=13.75)	43.50/46.00 (AK=2.50)	44.00/47.50 (AK=3.50)
OS	57.08	44.50/62.50 (AK=18.00)	43.25/47.75 (AK=4.50)	43.50/47.00 (AK=3.50)

Update

RM returned for follow-up and reported "spectacular vision" (20/15-) and was excited to soon begin playing baseball with his improved vision. RM reported good comfort at the time of follow-up and was able to wear his contacts for 15 hours or more a day. His corneal thickness will be monitored annually for any thinning.

Acknowledgements

Special thanks to Caroline Ooley OD, Rima Sabbah, Matt Lampa OD, and Pacific University College of Optometry